DISCUSSION OF THE AMENDMENT

Claims 1-22 are active in the present application. Claim 19-22 are new claims. Support for new Claims 19-22 is found in the Background of the Invention of the present application.

No new matter is believed to have been added by this amendment.

REMARKS/ARGUMENTS

The Office rejected the presently pending claims over a combination of Lawrence (US 3,923,567) and Falster (US 6,100,167). It is the Office's opinion that it would be obvious to replace the heating step (i.e., gettering step) of Lawrence with the heating step (i.e., annealing step) of Falster.

The Office completely misses the boat with respect to whether it is appropriate to combine Lawrence and Falster. Lawrence describes a process that must include a gettering step. The inclusion of this step as a required part of the Lawrence invention is disclosed at column 2, lines 50-54 (underling added):

> This invention employs a low temperature phosphorus gettering step which reduces the concentration of point defects (vacancies and contaminant impurities) in silicon wafers to levels very often less than those concentrations grown in the original crystal-ingot.

The gettering step of Lawrence is carried out at a temperature of around 1,000°C (see column 4, lines 21-23):

> The getter step employs a furnace temperature of 1,040°±50°C and a functionally infinite source of phosphorus for diffusion to maximize purifying effectiveness.

The gettering of Lawrence is carried out by heating the prior art silicon wafer to a temperature around 1,000°C in the presence of a phosphorus dopant. Applicants submit that it is readily recognized by those of skill in the art that phosphorus is an "n-type dopant". As support, Applicants submit herewith information obtained from www.nobelprize.org which states that n-type dopants can be found in Group 15 of the Periodic Table. Group 15 of the Periodic Table includes elements such as phosphorus.

Boron on the other hand is a p-type dopant. As support, Applicants submit herewith information obtained from www.nobelprize.org which discloses that p-type dopants include elements of Group 13 of the Periodic Table including boron

P-type and n-type dopants have substantially different functionality and properties. An n-type dopant donates electrons to the semiconductor. A p-type dopant functions to steal electrons from the semiconductor and forms electronic holes in the semiconductor (see the attached descriptions from www.nobelprize.org).

It is readily recognized in the art that adding p-type and/or n-type dopants to a semiconductor will necessarily affect electronic properties of the semiconductor such as resistivity.

Lawrence discloses a process that includes a gettering step whereby phosphorus is diffused into a silicon wafer, e.g., a n-type dopant is diffused into a silicon wafer. The annealing step of Falster uses a p-type dopant, e.g., boron, at a substantially lower temperature than the gettering step of Lawrence. Thus, one substantial reason why one of ordinary skill in the art would not be motivated to modify the Lawrence process by replacing the Lawrence gettering step with the Falster annealing step is the fact that the Lawrence and Falster processes are used for semiconductor materials having substantially different properties, e.g., n-type versus p-type silicon wafers.

Moreover, the process of Lawrence is one which removes vacancies from the prior art silicon wafer (see column 2, lines 50-54 of Lawrence).

Falster makes it clear that boron must be used in the prior art annealing step (see the paragraph bridging columns 2 and 3 of Falster):

> Without being bound to any particular theory, it is believed that copper forms some sort of complex with boron and is incorporated or "stored" in this form in boron doped silicon wafers.
>
> ...
>
> The increase in the concentration of copper on the surface of a wafer as a function of time depends, in part, upon the amount of copper which is contributed by the polishing process, and, in part, upon the boron concentration of the wafer. As the boron concentration of the wafer increases, the "storage" capacity for

> copper and the potential for time-dependent copper surface concentration likewise increase.
>
> Subjecting boron doped wafers to a low temperature anneal for a relatively short period of time in accordance with the present invention increases the rate at which the copper-dopant complex is dissociate and copper diffuses to the surface from the bulk of the wafer...

See column 2, line 66 through column 3, line 23 of Falster.

As already stated above, boron is a p-type dopant that steals electrons from the silicon wafer and forms holes therein. The Office's assertion that it would be obvious to use the boron-based, p-type dopant annealing step process of Falster in the phosphorus-based, n-type process of Lawrence ignores this basic difference between the Falster and Lawrence disclosures.

Similar arguments were presented in the Amendment filed in the present case on December 14, 2006. In response the Office stated that Applicants improperly argued against Lawrence alone and not the combination of Lawrence with Falster (see the Office Action of March 12, 2007). In this regard, Applicants draw the Office's attention to the comments above which give clear reasons why it would not be obvious to combine the cited prior art.

The arguments of the December 14, 2006 Amendment bring forth a further reason why it would make no sense to modify the Lawrence process to arrive at the presently claimed process; namely, Lawrence *adds* phosphorus to the prior art silicon wafer. Adding a dopant to a wafer is directly contradictory to the presently claimed process which reclaims silicon wafers so that they may be reused. In this regard, Applicants draw the Office's attention to dependent Claim 17 which requires that the claimed process is carried out to provide a silicon wafer having the same specific resistance as a virgin silicon wafer. Applicants submit that it is impossible for the specific resistance of a silicon wafer to be unchanged after it has been subjected to gettering with a phosphorus source to thereby introduce an n-type dopant to the silicon wafer.

Claim 18 further emphasizes the distinction between Falster and Lawrence. Claim 18 says the heating/removal process of the present claims "does not vary the specific resistance of a p-type or n-type silicon wafer". The subject matter of Claim 18 must be patentable over Lawrence and Falster whether considered alone or in combination, because each of Falster and Lawrence must necessarily change the specific resistance by utilizing different types of dopants, i.e., p-type and n-type, respectively.

Applicants further draw the Office's attention to new dependent Claims 19-22. New dependent Claims 19-22 provide further detail about the claimed process. For example, new Claims 21 and 22 make it clear that the claimed process must include reclaiming the silicon wafer. New Claim 19 further makes this point clear by including steps by which the silicon wafer is first used in a semiconductor chip making process before undergoing reclaiming.

Applicants submit that the combination of Lawrence and Falster makes no sense at least because the Falster and Lawrence processes are contradictory to one another because (1) Lawrence requires a gettering temperature of around 1,000°C that is substantially higher than the annealing temperature of Falster and (2) the Lawrence and Falster processes utilize contradictory dopant-types, e.g., p-type and n-type respectively.

Moreover, Falster does not describe a process whereby a silicon wafer is reclaimed. Instead, Falster discloses a process for removing copper from a silicon wafer before it has been used in a semiconductor manufacturing process. See for example the disclosure at columns 1 and 2 where it is disclosed that the copper is present in the silicon wafer because of a polishing process (see also column 3, lines 12-18). Falster does not disclose that the silicon wafer was previously used in a semiconductor manufacturing process.

The Office is therefore incorrect in asserting that "Falster et al. teaches in a method of reclaiming silicon wafers..." (see page 4, line 8 of the March 12, 2007 Office Action).

This point also demonstrates that one of skill in the art would not combine Falster and Lawrence. Falster teaches annealing after polishing (e.g., to remove copper added by the polishing). On the other hand Lawrence requires gettering before polishing. For example, Lawrence discloses the following in the abstract:

> The method comprises the steps of gettering... Other steps include... and finally polishing the front face of the wafer...

The combination of Falster and Lawrence therefore further does not make sense because Falster and Lawrence require carrying out the steps of their respective methods in different sequences that are incompatible with one another.

Although the Office appears to reject Claim 15 as indefinite, the Office characterizes the rejection as one wherein "applicant is invited to clarify this issue." Applicants submit that Claim 15 is not indefinite. The first full paragraph on page 10 of the specification clearly describes a process wherein the heating/removal process is carried out in air.

For the reasons discussed above, Applicants submit the rejection of not supportable and should be withdrawn. Applicants request allowance of all now-pending claims.

Respectfully submitted,

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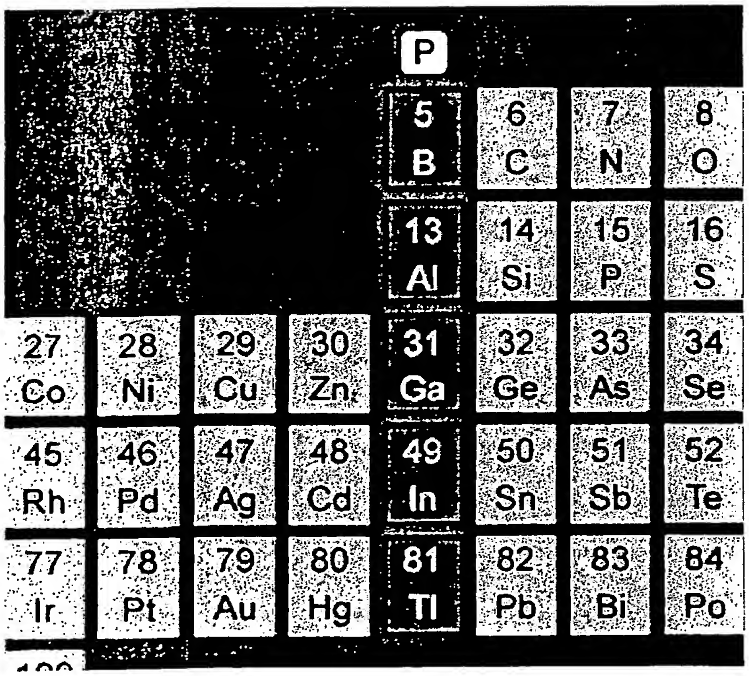

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P-type Dopants

The other type of dopants, the p-types, can be found in group 13 of the periodic table. The element boron (B) is one example of such a p-type dopant. These p-type dopants introduce something called holes in the semiconductor. You could say that they steal electrons from the semicondutor. Because of these electron deficiencies, the total negative charge is reduced and the holes can be thought of as positive charges, thus the name.

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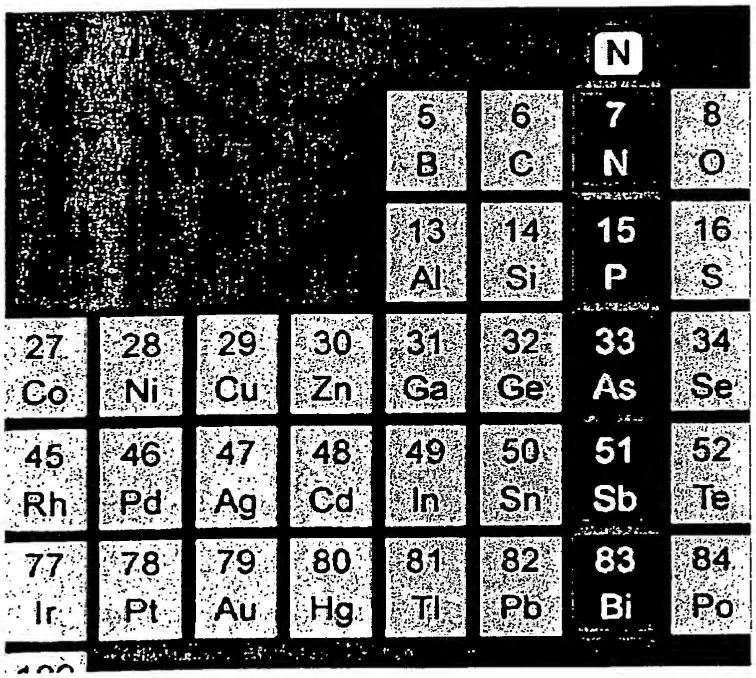

N-type Dopants
Some of the most common n-type dopants are located in group 15 of the periodic table. One example of such an dopant is the element phosphorus (P). The n-type dopant adds negatively charged electrons to the semiconductor, thus the name. Sometimes these dopants are called donators because they donate electrons to the semiconductor.